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The Rise of The Cyborgian Epoch

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Abstract— In this modern era of rapid technological progress and stupendous growth, man strives for that extra bit, the ever-evasive step in pursuit of 'perfection'. The advents of implausible technologies in the recent times have made this dream near fruition.

Neural interfacing is one of those beacons towards this quest for achieving invincibility. In this paper we try to highlight the gigantic scope of this phenomena in the futuristic gizmo-filled world that is inevitably around the horizon. Neural interface refers to a potent bridge between the inherent nervous system and any external media, generally a computer. Specifically, we focus on cyborgs (cybernetic organisms) which incorporate this particular scientific know-how in their functionality. Some companies have already begun tapping its plethora of utilities envisaging the positive aspects on mankind. These companies innocuously strategize on the development of the cyborgs for general betterment and upliftment of the community. Underlying this philosophy, they continue to vehemently deny the naysayers' apprehensions about the clearly evident lacunae.

Keywords- Cybernetics, Cyborg, Cyborgation, Hybrot, Computerised Information Systems, Kodachrome camera, pace-maker, neuro-morphic modeling, Cochlear Implant, Bionic Eye, rebreather, Cyborg Lobster.

I. INTRODUCTION

Cybernetics is the interdisciplinary study of the structure of the regulatory system. It has established itself as one of the disciplines that holds the key to mankind's dream of an utopian Society. Contemporary cybernetics began as an interdisciplinary study connecting the fields of control systems, electrical network theory, mechanical engineering, logic model, evolutionary biology etc.

When an organism is partly human and partly machine then we call them CYBORG. The whole process of transforming into a Cyborg is known as Cyborgation. Among the Cyborgs living today Dr. Kevin Warwick heads the Cybernetics Department at the University of Reading in the United

Kingdom and has taken the first steps on this path, using himself as a guinea pig test subject receiving, by surgical operation, technological implants connected to his central nervous system. The world's first cyborg was a white lab rat, part of an experimental program at New York's Rockland State Hospital in the late 1950s. The rat had implanted in its body a tiny osmotic pump that injected precisely controlled doses of chemicals, altering several of its physiological parameters. This rather innocuous start has opened up a revolutionary expanse of imagination and innovation in the world of science and technology.

II. TOPIC DETAILS

A. What is Cyborg?

Cyborgs are embodied as conditional and conventional Cyborgs on their structural and functional departments. Structurally, cyborgation can take place either internally or externally.

Convenient cyborgs may refer to any external procurement of an exoskeleton for appeasing the over-hauled (revamped) fancy requisitions of body. Conditional cyborgation implicates replanting of bionic implants, the lost or defiled body part for the conventional living in the present environment.

Cyborgology contemplates on the chrysalis of Conditional cyborgs. One such example is C-LEG, which has elite gravity on the fact that it functions similar to our leg. These external mechanical parts works by the stimulations received or generated from our neural system as shown in Fig 1.0. Having hitherto learnt about the cyborg classification, the collocation can be here-by linked to human appositeness termed as "HYBROTS".

Hybrot is a cybernetic organism resembling a robot repressed by a computer, dwelled with both electronic and biological elements. The biological elements are rat neurons connected to a computer chip. This consummation was first sewed up by Dr. Steve Potter, a professor of biomedical engineering at the Georgia Institute of Technology. It is uniquely distinguished from cyborg because of it being an untrodden type of varmint engineered from organic and

spurious materials. Hybrot's can be ascertained as "semi-living" organisms. Hybrots have garnered immaculate aggrandizement and the reason being its longevity unlike human neurons, which usually perish in a stipulated time after being abstracted.



Fig 1.0 A typical Cyborg

III. OPERATIONAL ASPECTS

A silicon chip, encased in a glass tube, is implanted into any part of the body, especially the locale where most of the nerves are annexed. This is done in order to send and receive the electronic impulses. This chip is delineated in such a way that it can receive the nerve signals, amplify them and encode the signal into digital format by which proper computer accessibility is provided. Since wired connections between cyborg and computer seem cumbersome, wireless communication path is preferred. This scheme subsists a power supply, copper coil energized with respect to the signals from the "Cyborg" and Radio waves are meant to produce an electric current. On the other end, three mini printed circuit boards will transmit and receive signals. The implant is connected to the body through a band that cloaks around the nerve fibers and is conjugated by a very thin wire to the glass capsule. The chips in the implant perceive digital information and dispatch them to the computer instantaneously.

For example, when a finger is moved, an electronic signal navigates from the brain to mobilize the muscles and tendons that operate the hand. These Nerve impulses will reach the finger though. The signal procured from the implant will be analog and it ought to be transposed to digital in order to stockpile it in the computer.

Still, several studies on work, organizational culture, computerized information systems (CIS), networks, and human-machine dyads symbolize the concupiscence to reconnoiter, interpret, and divulge more than the efficiency of

cyborgs and their supposed capability to undo the "problems" of late industrial society. There is a desire to understand and to make meaning of the developing history of cyborgs, the development of their behavior and culture; the two interconnected through hands, wires and electronic mechanisms that bend the technological discourse towards cultural as well as digital ears.

IV. RESEARCH PROJECTS

A. *This project is based on the experiment conducted by cyborg Steve Mann*

The silicon chip implant is insinuated into the loftier part of the left arm, beneath the inner layer of skin and on top of the muscle and the device is consociated to the nerve fibers in the left arm. This nerve center carries more information than any other art of the anatomy and is copious and sinewy. The implanted chip retrieves data from the nerve fibers in the form of signals and then the bulk is disseminated to the computer, which in-turn store the tasks in a data base and executes them such as opening the doors, switching on and off of lights and giving vocal messages to the cyborg to clout its locomotion. Identify the Headings

B. *Experiments Proposed by cyborg Steve Mann*

Having hitherto learnt that the chip in the implant receives signals from the nerve fibers and accelerates them to a computer instantaneously, now we slowly nudge ourselves towards learning about a live example and that being, when we maneuver a finger, an electronic signal peregrine test from the brain to propel the muscles and tendons that operate the hand which serves as a pathway for moving the finger. The implanted silicon chip snags these nerve pulses and actuates them to a computer through a wireless path of communication. The version of the signal obtained is analog and it ought to be converted to digital form to obtain a plethora of signals in the computer. The computer receives the signal and sends it back to the implant. This ensures whether the same response of moving the finger will be by sending same impulse signal to the implant. When we waggle the left index finger, a corresponding signal is sent via implant to the computer and here it will be recorded and stored. Next, we can bequeath this signal to the implant, hoping to generate an action similar to the original and it is to be noted that no processing is done inside an implant. Rather, it portrays an etiquette similar to that of a buffer in memory demeanor, where in it just stores and receives data and nothing way further than that.

This earmarked kodachrome camera captures images and sends them to the silicon chip implant, where the images are sent to the brain and processing takes place which enables a blind person to visualize his/her sensory perceptions, even in the absence of eyes.

This technology not only assists the unsighted, but also equips a scope to capture signals culpable for happiness, pain, anesthesia and so forth. Experiments are also being conducted

to establish wireless communication between two persons by placing similar chips ,that are capable of using the energy in the body and can transmit and receive impulse signals between them. If this experiment is proved to be possible then “cyborg” which was assumed to be a science fiction is no more a distant dream. With this technique there would be no use of any speech to communicate ,just the impulses in the human body can be used to convey the information between each other. Thought communication will place telephones firmly in the history books. Another Important application of cyborgs would be in curing diseases. If this type of experiment works, we can foresee researchers learning to send antidepressant stimulation or even contraception or vaccines in a similar manner. With this we can gain a potential to alter the whole face of medicine, to abandon the concept of feeding people chemical treatments and cures and instead achieve the desired results electronically. Cyber drugs and cyber narcotics could very well cure cancer, relieve clinical depression.

V. CURRENT AFFAIRS

Cyborgs get a lot of their fame and infamy from the military. The military and medical are the main pursuers of new cyborg technology today. Whether soldiers use guns and tanks to complete missions, or they receive missions through satellite communication, they are part of a cyborg network. Whole new tactics are being taken in war to attack and obtain information itself. Catastrophic weapons are getting developed so that the standard soldier may wield them. The soldier of the Post Modern era will be the ultimate Cyborg Soldier.

Cyborgs, like all technology, must be prefigured in the human imagination before they can be realized in practice. The artist's job is to plumb the depths of the mind, wading through dreams and interpretations to yield some eternal truth that transcends the current paradigm and sets up the bridge to another, connecting reality and possibility. The cyborgs of today were once merely works of the imagination.

The artist's vision becomes synonymous with the spirit of the age, which acts as the catalyst for the building of social and scientific machinery. Life imitates art and art imitates life. Thus is the cyborg, whose characteristics are similarly over determined by the living and the artificial.

Most people consider all cyborgizations to be based in medical enhancements. Robocop and the Six-Million Dollar Man began as regular men who became superhuman through medicine based technology. While this field is arguably the most clear way to becoming a cyborg, prosthetic limbs are not the only methods to being “forged”. Today, we have technologies ranging from replacement knees to ultrasounds. In the future, artificial tastes and mind-controlled machines could become part of normal life. Whatever the method, these machines can help us reach our ultimate potentials.

When people think of divers they do not typically think of the word cyborg. People need to use tools, however, to

breathe, maneuver and explore the oceans of the world. Many fictional works have explored the idea of technology, humans and the ocean. Some big movies that have inspired, and been inspired by, current ocean technology are Finding Nemo, The Abyss, Aliens of the Deep, and The Life Aquatic with Steve Zissou. Many mainstream books, such as Shadow Divers have also brought forth to the general public that which is not always known about underwater diving.

VI. ADVANTAGES OF CYBORG

The amalgamation of human and mechanical parts act as a perfect foil to each other as it can rectify the underlying defects in the human body which are inevitable and imminent. The pacemaker can be quoted as a perfect example in which a mechanical part aids the critical functionality of a vital human organ, the heart. Hence, several tests have been carried out to transform humans to into these "flawless" cyborgs. Many replacement techniques have come to the fore encompassing these organs:

- Hip replacement
- Knees
- Elbows
- Wrists
- Arteries
- Veins
- Heart valves

Many experiments have delved into the animal kingdom. ‘Ratbot’ was an experiment that had a benign rat having a miniature electronic rucksack strapped to its back which was connected to electrodes in its brain. Simple instructions were sent and successfully deciphered by the chip implanted thereby validating the experiment. Consequently, researchers have envisioned their utility during disasters like earthquakes and landslides in underground mines as they are more flexible and dexterous than human rescuers or existing robots

VII. DISADVANTAGES OF CYBORG

The critics of bioelectronics and bio computing foresee numerous potential negative social consequences from the technology. One is that the human race will divide along the lines of biological haves and have-nots.

People with enough money will be able to argument their personal attributes as they see fit as well as to utilize cloning , organ replacement, etc. to stave off death for as long as they wish ,while the majority of humanity will continue to suffer from hunger, bad genes, and infirmity.

Certainly, it would be easy to utilize bio-implants that would allow people to trace the location and perhaps even monitor the condition and behavior of implanted persons. This

would be tremendous violation of human privacy, but the creators of human biotech might see it as necessary to keep their subjects under control. Once implanted with bio-implant electronic devices, 'cyborg' might become highly dependent on the creators of these devices for their repair, recharge, and maintenance.

It could be possible to modify the person technologically so that body would stop producing some essential substance for survival, thus placing them under the absolute control of the designer of the technology.

VIII. APPLICATIONS

A. Medical Cyborgs

External devices are a constant reminder of one's ineptitude. Medical cyborg is a collusion of medicine and technology to enhance or restore human biological processes. These technologies were the precursors before the cyborg revolution in medicine. The devices had to be carried all the time and a modest mishap could render a lethal breakdown. To avoid such baleful scenarios, simple, bitty and efficient machines were insinuated into the human body (wherever necessity demanded) with minimal effort. This technology paved a way to the evolution of the so called medical cyborg.

B. Cochlear Implants

Hearing implants are widely extrusive to assist people who are hard of hearing. In extreme contrivance, auditory nerve may not transmit action potentials to the brain because of the severe damage incurred to the ear and in such cases; Cochlear implants could well be used to promulgate the impulses to the brain. According to the National Institute of Deafness and Communication Disorders (NIDCD), a cochlear implant is defined as "a small, complex electronic device that can help to provide a sense of sound to a person who is profoundly deaf or severely hard-of-hearing". Cochlear implant is a mere substitute for hearing but it does not exactly restore hearing. It simply edifies artificial hearing. These implants have computer as a part of the system to congregate the sounds and then concoct it so it can be sent to the auditory nerve to produce a response.

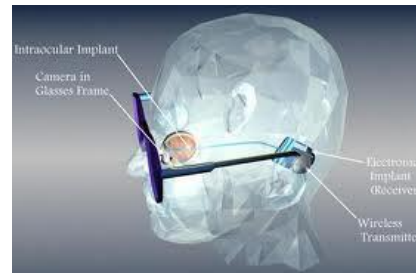


Fig 2.0 Bionic Eye

B. BIONIC EYE:

A visual prosthesis or bionic eye is a form of neural prosthesis intended to partially restore lost vision or amplify existing vision as shown in Fig 2.0. It usually takes the form of an externally-worn camera that is attached to a stimulator on the retina, optic nerve, or in the visual cortex, in order to produce perceptions in the visual cortex.

C. Scuba Diving

Many advancements have been made in the field of underwater diving (scuba diving) which contrast the prophecy of using tanks as an indispensable hunk of diving suits. Their main air flow was administered by a hose connected to a pump above water, usually man-powered. These consist of a jacket and trousers made of waterproof leather, a helmet with a porthole, and a metal front.

The advent of rebreathers actually refined the underwater cyborgian technology. These apparatus have allowed the exploration of undersea life without bubbles, so that photographers could get better pictures and biologists are more readily able to contemplate life in its natural habitat. They have also aggrandized the amount of time that a diver is able to sustain himself/herself underwater. The way that rebreathers work is essentially attributed to recycling technique that is the bubbles you breathe out.

Another emulating idea for a breathing system is the system invented by Alon Bodner, an Israeli inventor. He contrived battery powered gills in a tank, the system will pump in water, use an air separation technique to retrieve the oxygen from the ocean water, pump that through to the diver and then a recycling process, like in a rebreather, allows for more of that oxygen to be utilized. This should eliminate the need for air tanks, but it is still in its nascent stage. With a glimpse of this, humans emulating avant-garde fish is not a far-fetched dream.[1]

D. In Vitro-Fertilization

The transition from human to cyborg has become easier with the onset of immunizations, the Internet, prosthetics, and implants. In the last few decades, advances in prenatal technologies have been actualized to advocate infertility and curtail the jeopardy of genetic mutations. The influence of cyborg in this field is in the fledging state. The resulting baby can be considered a cyborg in some sense, not because of prosthetics or implants, but because it would not be able to live without the technological assistance.

In Vitro Fertilization(IVF)is one of the earliest and most common methods of conception for infertile couples. After two weeks of hormone therapy to stimulate ovaries, mature oocytes are retrieved from the female. The outer cells are removed to facilitate fertilization. Then it is mixed with sperm that has had inactive cells and fluid removed. In the event of low sperm count, the oocyte is injected with a single sperm, a process known as intra cytoplasmic sperm injection (ICSI). After the egg has split two or three times, at which point it is called a pre-embryo, it is re implanted into the womb, and the female takes hormones for two weeks to ensure uterus lining is suitable for implantation.

The language of IVF is loaded with cyborg discourse. In vitro refers to the process of fertilization and early maturation in laboratory dishes and test tubes, thus the nickname “test tube babies” for those conceived from IVF. Though IVF still uses the original reproductive materials from female and male, the otherwise natural process of fertilization is completely machinic. On success, the presence of fallopian tubules is obsolete, since the synthetic needle can extract eggs from ovaries. The penis becomes antiquated, when there is no ejaculation of sperms. Then superficial techniques devised for the retrieval of sperms can be thought of.

E. Work

Anabolic steroids are the synthetic hormones which analytically function like male hormones, comprehensively employed in sports arena, to aggravate the brawniness of the athletes way beyond normal. They synthesize Testosterone in excess, which avails the growth of bones and procreation of muscles. The aftermath of excessive usage of anabolic steroids is abrupt accumulation of Estrogen, which would in turn result in infertility and breast growth in males. They also cause various cardiovascular problems when taken in a relatively excessive amount.

F. Miscellaneous

Cyborgs can be used to regulate traffic with at most ease. With the ever increasing population in the world, there are no such adept rules which would indeed guide the traffic under clout. This would evolve a pathway for cyborgs in becoming so called "Traffic scrutinizers", which are in turn controlled by human ideologies by implanting silicon chips in the cyborg. This chip is programmed in such a way that it would be able to extricate voluminous and in-voluminous traffic and modulate it as per its master's adjuration. This looks a far-fetched credulous venture, but it would become invasive once it gets mustered.

G. Blink Bot

After a day-long strenuous work, no one intends on flexing even an extra muscle to satiate his/her hunger. A blink bot would seriously be a stupendous re-c course to suffice their purpose. A blink bot is controlled, just by an eye-blink. The user can bridle the locomotion of blink bot just by an eye blink to and it detects and maneuvers the object to a new destination as presumed. Generally, first blink is meant to diagnosticate the source and second blink, the destiny of the source.

Blink bot is necessarily an agglomeration of four components:

a) CAMERA:

Uses a camera and fiducials to track objects.

b) Ceiling mounted projector:

It provides visual clues.

c) Infrared laser:

Used for gaze detection.

d) Temple switch:

Meant for blink detection.

So the tag line of Blink bot goes this way" Be lazy ,Go crazy"

H. Sports

The parables of sport and its legends have often left us in awe. The gradual intrusion of technology in the sporting arena has often drawn flak from the purists who believe that this belittles the sanctum of a sportsman's human capabilities. While techno-freaks continue to strive for pin-point accuracy, many legends believe that a degree of human imperfection, albeit unintentional is necessary for a game to flourish. Several athletes with amputated legs have been disparaged on

the basis of possessing an unfair advantage in recent times. These athletes firmly affirm that they have been given a raw deal as cyborgization will solely shatter the glass ceiling and bring about an innovation. Realistically speaking, there is a sense of verity in this belief because with time, change is inevitable. We have witnessed a great deal of evolving equipment in tennis and cricket thereby asserting the feasibility for the advent of cyborgs in the sporting platform. Thus, keeping the ethical standards at bay and wholly focusing on cyborg applications, sports can definitely be an area on which great speculation can be put forth.

I. Cyborg Sharks

Sharks have always been an enigma to mankind. The very thought of these blood-curdling beasts is enough to send shivers down one's spine. However, recent studies have demystified the overtly exaggerated threat from these sea-giants. On the contrary, the advent of neural interfacing has transformed them into stealthy spies thereby providing crucial military aid and strategic planning. Their unrivalled innate senses coupled with the embedded chip acquit them with immaculate qualities and unbridled edge over other machines. They can be equipped with potent laser guns which can be used to temporarily immobilize an enemy in times of jeopardy. The defense advanced research agency, DARPA should be lauded for their concrete efforts to bring this ground-breaking brainstorm into existence, although it is still being envisioned in its incipient stages.

J. Cyborg Beetles

Ever wondered if a thing as benign and naïve as a beetle can be used in an area of paramount importance like the military!? Well, recent berserk technological progress has given an entirely new dimension to the military arsenal possessed by armies all over the world. Beetles as shown in Fig 3.0 are embedded with a miniscule chip are being used by armies to gain strategic superiority over hostilities. These miniatures innocuous looking insects are robust enough to harm fatally by poisoning, if need be so. Moreover, the insect is fuelled by its own body chemistry, thus keeping them cognizant for longer durations.

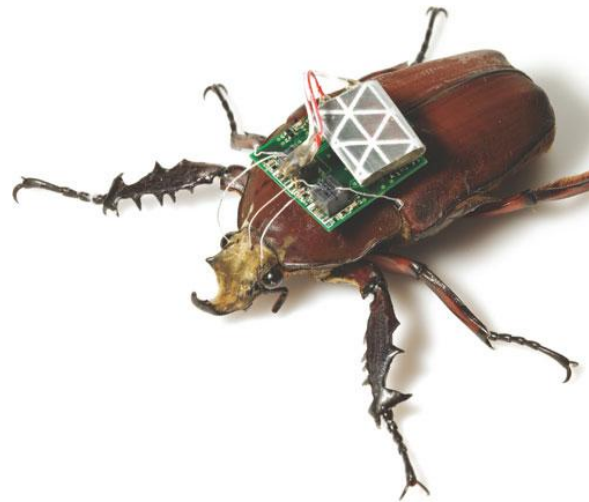


Fig3.0 Cyborg Beetle

K. Brain Computer Interface

Brain Computer Interface is a collage of profound technologies from many different fields including Computer science, Electrical engineering, and bio medication. It has quite well emerged from the school of thought as Deep Brain Simulation, which is the process of electrically shocking the brain to regulate it in individuals with movement disorders ,epilepsy and depression too. It is pretty much credible to authorize the mind of a living being by implanting an electrode cap (set of electrodes), which is in turn conjoined to a peripheral computer which is inbuilt with translation algorithms, which elucidate the impulses into responses and remit them, which consorts a locomotion as shown in Fig 4.0 .This concept could well be used to hack a human vision system and imagery of human thoughts which could fragment the retrospective and present deeds of the anti-social communities.

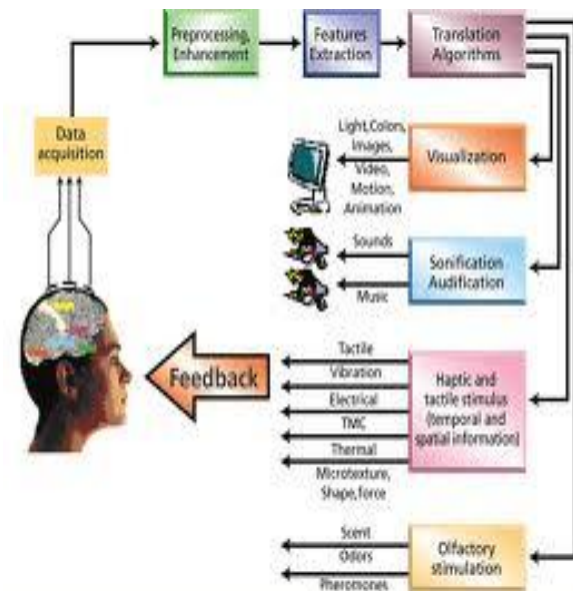


Fig 4.0 Brain Computer Interfacing

L. Extracting power from Lobsters

Researchers at the Potsdam's Clarkson University have converted glucose from the body of a snail to electricity as shown in Fig 5.0. This time they have moved up the food chain, that is they are in a notion to bring about the same analogy in the lobsters. Of course, it is not yet possible for the power so generated to juice up your I Phone or the like, but the aim is to at least power bio medical products like pace makers, insulin injectors and a number of similar applications.

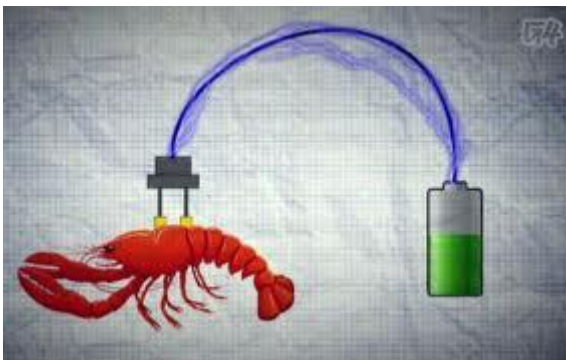


Fig5.0 Cyborg Lobster

M. Google Glasses

Google Goggles is a downloadable image recognition application created by Google Inc. which can be currently found on the Mobile Apps page of Google Mobile. It is used for searches based on pictures taken by handheld devices. For example, taking a picture of a famous landmark would search

for information about it, or taking a picture of a product's barcode will search for information on the product.

N. Cyborg Color Translation

Artist, cyborg, and Shamengo pioneer Neil Harbisson has envisaged a new way of seeing the world ironically being color-blind himself. His "eyeborg" electronic eye, which is connected to his skull through tangible wires, translates light rays into audible microtones, thereby opening new realms of possibilities and research and empowering the blind with the power of vision.

O. Mars Cyborg Rover

Are we alone? Or was there life on another planet? NASA's \$2.5 billion dream machine, the Mars Science Laboratory has already rambled towards finding out the answer for the million dollar question. Scientists have found signs of water on the Red Planet, which is Earth's neighbor, hinting that some form of life was once likely even though Mars is now a dry place with a thin atmosphere, extreme winters and dust storms. The nuclear-powered rover as shown in Fig 6.0 is the biggest ever cyborg built for planetary exploration-weighing in at one ton about the size of a small car-and carries a complex chemistry kit to zap rocks, drill soil and test for radiation. The landing however is a daring and unprecedented maneuver. It involves penetrating the atmosphere at 13,200miles per hour, slowing down with the help of a supersonic parachute and dropping down gently with tethers from a rocket-powered sky crane. This rover will investigate the Gale Crater, named after the Australian astronomer Walter Fredrick Gale, to see if the site offers the potential of water. This potential cyborg's has already taken the charge of exploring the intricate aspects of the red planet, inching closer to it and according to the sources; it was approximately 2, 61,000 miles from Mars. Things started getting scarier for the NASA scientists because only 40% of the attempts by global space agencies to send spacecraft to Mars have succeeded. But risk is certainly entailed when it comes to the perfect landing and getting the mission accomplished. NASA has detailed the complex landing in an internet video called SEVEN MINUTES OF TERROR.



Fig6.0 Cyborg Rover

P. Cyborg in Gaming

Brain fingers connect mind and matter with equipments like cyber links. A cyber link is a head band comprising of three plastic sensors, which generates responses. Voltages at the fore-head are developed every time we contract the facial muscles of even when we change the brain-wave patterns

IX. CONCLUSION

Cyborg possesses a great deal of functionality and is of critical use to mankind if tapped in the proper way. Sophomores have already started initial testing in the military and defense sectors. The research is showing a commendable degree of insight in the lacunae of modern day defense systems. The prospect of a cyborg soldier is certainly palatable for the governments of nations to maintain their national security. Even in the field of sports, Cyborgs are gradually making a mark thereby challenging radical thoughts and stereotypes. The ethicality of this new entrant may always be in question but it has definitely made the scenario more intriguing. Moreover, the innocuous ease with which the human shortcomings are being overcome is spell-binding. Blink-bots, cochlear implants, bionic eye are few of the recent propositions which has taken the world by storm. Hence, new innovations are propping up everyday opening new realms of rapid technological progress. Even exotic and enigmatic fields like space have started using this science to track extra-terrestrial life. Although there will always be a few palpable hurdles, one cannot deny the fact that these "tech-tampered

beings" have the potential to completely transform the essence of human existence on this planet. Therefore, the need of the hour is to let responsible minds or organizations lay down pragmatic paradigms based upon which this brainstorm can be utilized for the overall elevation of the human race.

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